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TECHNICAL MANUSCRIPT 572

A PORTABLE CHAMBER FOR THE GROWTH AND ISOLATION OF INFECTED PLANTS

Robert G. Emge
J. Stanley Melching
Charles H. Kingsolver

JANUARY 1970

DEPARTMENT OF THE ARMY
Fort Detrick
Frederick, Maryland

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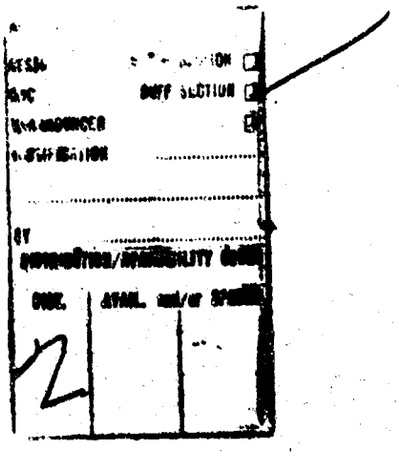

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Plant Pathology Division
PLANT SCIENCES LABORATORIES

Project 1B562602AD09

January 1969

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A PORTABLE CHAMBER FOR THE GROWTH AND ISOLATION OF INFECTED PLANTS

ABSTRACT

An easily portable unit, consisting of an aluminum tubular frame covered with transparent polyvinyl sheeting, has been developed to contain infected plants and exclude airborne fungal contaminants. A 100-cfm squirrel-cage blower supplies air through a filter to the interior of the chamber, maintaining an internal positive pressure that prevents the entrance of contaminants when the unit is opened. Air is exhausted through a filter at a rate that provides sufficient flow through the chamber to hold the interior air temperature at approximately that of the outside ambient air. This air flow causes no visible agitation of the plants.

In laboratory and greenhouse studies of physiologic races and single-spore isolates of various fungi on their hosts, the problem of cross contamination is always present. Lamp chimneys, bench dividers, and plastic bags, although commonly employed to provide some degree of isolation, often fail to accomplish the objective.

A chamber has been developed that is portable, inexpensive, and efficient in containing and in excluding particles 5 microns in diameter and larger. The assembled unit is 15½ inches wide, 24 inches long, and 24 inches high and accommodates 15 four-inch pots (Fig. 1). The frame is made of ½-inch aluminum tubing connected at the corners by friction joints (Fig. 2). The three-sided friction joints are made by soldering one half of a copper coupling joint to a copper 90-degree elbow joint. Transparent polyvinyl sheeting, 20 mil in thickness, is welded to form a one-piece enclosure with an opening in one side fitted with a plastic slide closure.

The frame sections, precut to proper lengths, are easily assembled within the plastic enclosure, using the friction joints. Holes are cut in the rear wall to accommodate the supply and exhaust filters. The filters are sized and placed to provide an adequate and uniform flow of air through the chamber with little or no visible agitation of the plants. Type 25 FG fiberglass filter medium is used for both the supply and exhaust filters. This material is classified as medium-efficiency with a 1- to 5-μ particle size retention of 60 to 90%.* The interior core of the filter is a tube

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* Decker, Herbert M.; Buchanan, Lee M.; Hall, Lawrence B.; Goddard, Kenneth R. 1962. Air filtration of microbial particles. U.S. Public Health Service Publication 953. U.S. Government Printing Office, Washington, D.C.

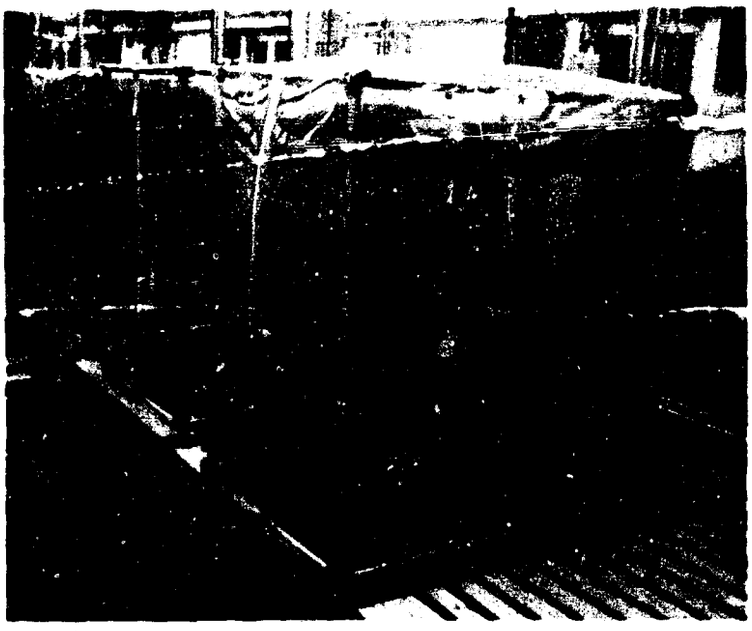

FIGURE 1. Isolation Chamber, Operational in the Greenhouse.

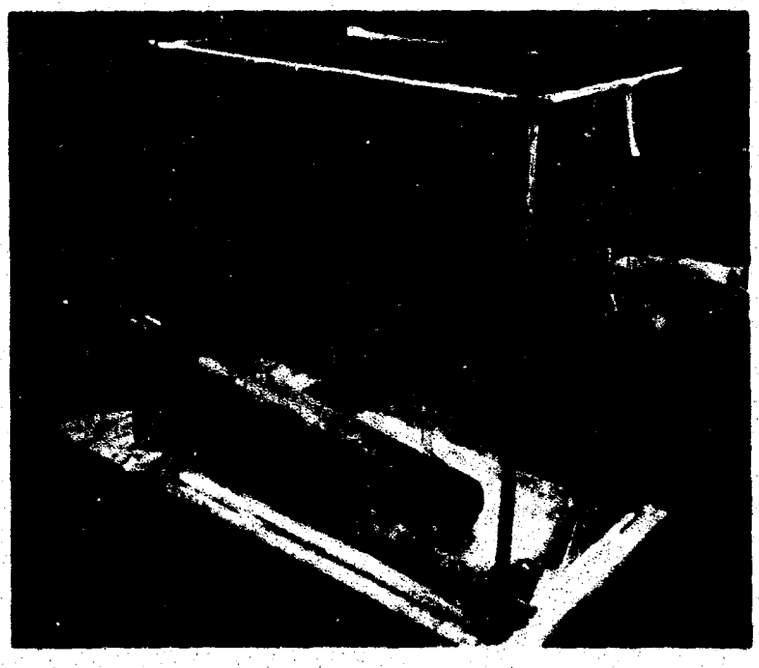

FIGURE 2. Isolation Chamber, Showing Tubular Aluminum Frame, Polyvinyl Enclosure with Zipper Opening, Exhaust (Upper) Filter, Supply (Lower) Filter, Air Supply Blower, and Subirrigation Pan.

of ½-inch-mesh hardware cloth, 24 inches long; the supply filter diameter (2½ inches) is larger than that (2¼ inches) of the exhaust filter, creating a slight positive pressure within the chamber during operation. A single layer of the filter medium is applied to the surface of the core and is held tightly in place by wrapping it with aluminum wire screening. The upper (exhaust) filter is sealed at one end with tape to a collar welded about the hole in the enclosure wall, and the opposite end is sealed air-tight with an RTV* silicone rubber compound (transparent in the photographs). The lower (supply) filter is similarly sealed and attached to a collar, and the external blower is affixed to the collar by an adaptor. The capacity of the electrically powered blower unit is 100 cfm of free air delivery.

A galvanized pan (14 by 22½ by 1½ inches) is placed on the floor within the enclosure to protect the plastic and to permit subirrigation of the pots of plants.

To test the chamber, uredospores of Puccinia striiformis West were released into the blower inlet. Vaseline-coated glass slides placed within the chamber at various orientations surrounding the supply filter were free of spores when examined after an exposure time of 1 hour. When spores were aerosolized within the chamber, none was found on slides exposed to the exhaust air.

Several of these isolation chambers have performed satisfactorily for over a year. Within these and similar chambers the growth of wheat, tomato, and bean plants from seed germination to maturity has been vigorous and apparently "normal" compared with conventionally grown greenhouse plants. The unit could be adapted for working with particles of less than 5 microns diameter by utilizing a higher-density filter medium and increasing the blower capacity. A small, window-type air conditioner could be attached to one or more units when a temperature lower than that of the greenhouse ambient air was required.

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* RTV = Room temperature vulcanizing.

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13. ABSTRACT

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14. Key Words

Isolation chamber
Infected plants
Cross contamination
Portable equipment
Transparent
Multipurpose

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